Eastern Europe and the former Soviet Union since the fall of the Berlin Wall: Review of the changes in the environment and natural resources

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Eastern Europe and the former Soviet Union since the fall of the Berlin Wall: Review of the Changes in the Environment and Natural Resources[1]

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ABSTRACT. This paper reviews the environmental record of the transition countries of Eastern Europe and Central Asia since the fall of the Berlin Wall, with a focus on areas of key concern to public policy at the present time. With the impacts of environment on public health being given the highest priority, we examined several associated health indicators at the national level, as well as looking at important environmental issues at the local level. In this respect, we focus on environmental problems related to air and water quality, land contamination, and solid waste management. Despite showing a highly differentiated performance across the region, the results suggest that inadequate environmental management seen in several of the transition countries in the past 20 years has put people's health and livelihood under huge threats. Moreover, this paper looks at the development of policy responses and resources, i.e. environmental expenditures, in these countries, during the process of transiting from centrally planned economies to market-based one. Similarly, we identify various degrees of progress across the region. The findings reinforce the need for better coherence between national environmental expenditure and international environmental assistance, as well as the actual enforcement of national regulations and international agreements in those non-EU transition countries.

Key Words: transition countries; environmental issues; public health; land contamination; air pollution, water pollution; policy; environmental expenditure

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I. INTRODUCTION

The environmental record that transition countries inherited from the centrally-planned past was a mixed one. Compared to their free market counterparts, they were less burdened by air emissions from mobile sources due to fewer vehicles and had a smaller quantity of waste to manage because of fewer consumer goods. On the other hand, industrial emissions were high and some of them were extremely toxic. Data on these are not easy to come by, but there are some documented cases of very serious damages from industrial and military operations that affected human health both directly and indirectly. In terms of natural resources the record was also various. While some areas such as the Caspian Sea were managed more or less sustainably, others such as the Aral Sea were horribly overexploited from an environmental point of view.

Over the last 20 years, progress has been made at a highly uneven rate across the region. While some of the countries are closer in terms of environmental performance to those of Western Europe, others are similar to the lower middle income and low-income group of countries. One clear message from this review is indeed of a highly differentiated performance across the region. As a consequence, most of the data in this paper will be presented for the following groups, which are relatively homogeneous:

a. New Accession Countries, comprising those that have joined the EU - Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia and Romania
b. The Balkan countries of South Eastern Europe, consisting of Albania, Bosnia and Herzegovina, Croatia, The Former Yugoslav Republic of Macedonia, Serbia and Montenegro
c. The former members of the Soviet Union located in Central Asia, including Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan
d. The other former members of the Soviet Union located in the European part of the USSR, consisting of Belarus, Moldova, Russian Federation (Russia hereafter) and Ukraine

In addition to these 28 countries, this paper also looks at Turkey, which is not a transition country in the same sense but is, as the others, a part of the region under review here. Group b, along with Turkey, is also referred to as the South East Europe (SEE) and groups c and d are also referred to as Eastern Europe, Caucasus and Central Asia (EECCA)[2].

The paper looks at the environmental record of the countries of Eastern Europe and Central Asia since the transition, with a focus on areas of key concern to public policy at the present time. Paramount among these is the impacts of environment on public health and is given the highest priority in this review. Hence, section II starts with reviewing main health indicators that are influenced by environmental performance, followed by examining the burden that several environmental factors have put on people's health and life. Health impacts as a result of inadequate management of the environment at local level will also be looked at. Section III examines other indicators

[2] These classifications have been used in a series of reports of Europe's Environment.

for environmental performance, such as forestry, agriculture, biodiversity, etc. Section IV examines the developments in environmental policy over the last 20 years across the region and identifies areas where progress has been made as well as ones where much remains to be done. Section V concludes this paper.

II HEALTH AND THE ENVIRONMEN SINCE TRANSITION

At the outset of the transition, health indicators in the transition countries that were, to a significant extent, affected by environmental performance were worse than in the high income countries, but at the same time better than in low-income countries of Africa and Asia[3]. By 2006 the gap had only closed for some countries and in fact had even widened for others. Table 1 gives the data for Tuberculosis (TB hereafter), infant mortality and the population with sustainable access to drinking water. It shows that:

a. In 1990 the incidence of TB in the region was 50 percent to 224 percent higher than in the high-income countries. By 2006, while the high-income countries had managed a reduction of 46 percent, only South East Europe, Turkey and the New Accession countries of this region had seen any reduction and, apart from South East Europe, the gap in incidence with the high-income countries had widened. In fact Central Asia and the other CIS countries had actually seen a large increase in incidence.
b. Infant morality rates in high-income countries fell 39 percent during the period 1990-2006, while that in the New Accession Group, South East Europe and Turkey fell by more, thus closing the gap between them and their high-income counterparts. Rates in Central Asia and the other CIS fell by slightly less, thereby widening the gap with the high-income group, but at the same time they fell by more than the low-income countries, thus also widening the gap with them[4]. A similar picture holds for the under-5 mortality rate.
c. Access to improved drinking water has improved in the region, especially in Turkey and the New Accession states, thus closing the gap with the high-income countries. Apart from Central Asia, rates are now in the high 90 percent levels in most countries in the region, although this is one area where the data can be misleading[5] and in fact improvements are not as great as they appear.

[3] High and low income countries are as defined in the World Bank classification.

[4] In fact previous survey data supported by the World Bank pointed out much higher infant mortality rates for some CIS countries than the UN/WHO data which casted doubt on the latter and made the difference between that region and other transition groups of countries even greater. (Markandya, Zhu, and Strukova, 2003)

[5] The official definition of adequate water supply is in terms of sources (piped water or water from a well that is less than 20 meters from the dwelling). In the transition countries these are not the critical issues, but rather the quality of the water and the regularity of supply. Water samples taken in newly independent transition states frequently do not meet chemical and microbiological standards, and frequency of supply is poor. In some cases the proportion of such samples is more than half! These factors are critical in the region, yet they are not picked up in the selected indicators. The impact of poor quality is particularly serious for the poor, who are least able to take aversive action by buying mineral water or ensuring that the water is suitably disinfected.

Table 1: Health and Environmental Indicators

Country Group	Incidence of TB			Infant Mortality Rate			Sustainable Access to Improved Drinking Water		
	1990	2006	Change %	1990	2006	Change %	1990	2006	Change %
High Income	29.0	15.5	-46%	8.7	5.3	-39%	99.2	99.2	0%
Low Income	177.9	214.6	21%	90.6	67.2	-26%	66.3	78.8	19%
Transition Group									
New Accession	48.7	47.2	-3%	16.1	7.8	-52%	90.3	95.4	6%
South East Europe	65.4	34.6	-47%	23.0	9.4	-59%	98.1	98.8	1%
Central Asia	61.9	117.6	90%	63.6	40.1	-37%	87.2	87.8	1%
Other CIS	44.1	105.2	138%	18.2	12.2	-33%	94.4	97.0	3%
Turkey	49.0	29.0	-41%	67.0	24.0	-64%	85.0	97.0	14%

Source: Own calculations based on WHO data (WHOSIS)

†Incidence of TB is per 100,000 of population. Infant mortality rate is per 1,000 live births. Group averages are calculated using 2006 population weights.

Another important health indicator associated with environmental performance is life expectancy. The figures in Table 2 show that while both high-income and low-income groups improved life expectancy by 7 percent between 1990 and 2006, the transition groups of countries did considerably less well. The New Accession countries were the best performers, but even they did not close the gap with the high-income countries. The worst performing set was the group of the other CIS countries, which saw a fall in life expectancy of three years during the period. Turkey, by contrast, actually closed the gap with the high-income countries, with an improvement of 12 percent.

Table 2: Life Expectancy at Birth

	Life Expectancy at Birth		
Country/Group	1990	2006	Change %
High Income	75.00	80.00	7%
Low Income	55.00	59.00	7%
Transition Group			
New Accession	70.51	74.22	5%
South East Europe	71.44	73.65	3%
Central Asia	64.56	66.07	2%
Other CIS	69.31	66.41	-4%
Turkey	65.00	73.00	12%

Source: WHO data (WHOSIS)

Four main environmental factors have been identified here as responsible for damage to human health[6] in transition countries: 1) indoor smoke from burning of solid fuels in the home, 2) use of leaded transport fuels, 3) outdoor air pollution and 4) unsafe water, sanitation and hygiene. Table 3 provides estimates of losses from these sources in transition countries and for Germany and the UK as a comparison. The data shows burdens from outdoor air pollution significantly higher than in Western Europe for all regions. Much of this is the result of poor controls on all sources, stationary, e.g. industrial emissions, as well as mobile, i.e. transport[7]. The contribution of indoor

[6] It is difficult to say how much of the health indicators are due to environmental burdens but doubtless at least a part of the health of the population is a result of such factors.

[7] Cities where pollution concentrations exceed maximum permissible standards as defined by the WHO include Tbilisi in Georgia, Almaty, Ust Kamenogorsk, Ridder and Temirtau in Kazakhstan, Bishkek in Kyrgyzstan, Chisnau in Moldova, Belgrade in Serbia, Dushanbe in Tajikistan, Ahsgabat in

smoke can be as high as 5.2 percent of all deaths, in Central Asia. Exposure to lead is still an issue outside the New Accession Countries, although it has been declining throughout the region with a phasing out of its use in gasoline[8]. Finally the deaths from unsafe water and poor sanitation are only estimated for Tajikistan and Turkmenistan, where they account for about 3 percent of all deaths. It is likely that poor water and sanitation are also responsible for significant morbidity and mortality impacts in other countries as well, especially in Central Asia and South Eastern Europe.

Table 3: Percent of Deaths Attributed to Environmental Causes

Country Group	**Outdoor Air Pollution**	**Indoor Smoke from Solid Fuel**	**Exposure to Lead**	**Unsafe water and Sanitation**
New Accession	0.6 to 2.1	-	-	-
South East Europe	0.6 to 2.1	0.7 to 1.3	1.1 to 1.3	-
Central Asia	1.1 to 2.6	1.6 to 5.2	1.3 to 1.5	3.2 to 3.3
Other CIS	1.2 to 1.4	1.3	1.1 to 1.2	-
Turkey	-	-	1.3	1.8
Germany and UK	0.6	0	0	0

Source: WHO (2005).
†'-': No data reported

The environmental pressures that are responsible for these deaths also contribute to higher levels of morbidity in the form of respiratory and diarrhoeal diseases in the region. Table 4 reports the disability-adjusted life years lost per 100,000 of population in the transition groups defined above as well as in the high-income country group as a result of these diseases. The Disability Adjusted Life Year or DALY is a health gap measure that extends the concept of potential years of life lost due to premature death to include equivalent years of healthy life lost by virtue of being in states of poor health or disability. One DALY can be treated as one lost year of healthy life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability.

Table 4: DALYs Lost per 100,000 of Population from Respiratory and Diarrhoeal Diseases

Country Group	**Diarrhoeal Disease**	**Respiratory Disease**
New Accession	31	700
South East Europe	46	778
Central Asia	316	2,182
Other CIS	37	1,098
Turkey	335	1,605
High-Income Countries	36	884

Source: WHO Burden of Disease Database (2004)
†Respiratory diseases include chronic obstructive pulmonary disease (COPD), asthma, lower and upper respiratory tract infections and otitis media. Data are for 2002 for the transition countries and Turkey and for 2004 for the high-income country group. Unfortunately comparable data are not available for earlier periods.

The data shows considerably higher losses from diarrhoeal diseases in Central Asia and Turkey than in the other transition countries. In fact the latter are not so different from the high-income countries as a group with respect to diarrhoeal incidence. As far as respiratory illnesses are concerned, Central Asia stands out with rates more than

Turkmenistan and Kiev, Donetsk, Lutsk and Odessa in Ukraine. In addition several Russian cities do not meet air quality standards. (EEA, 2003)

[8] Lead is still being sold in Tajikistan, Turkmenistan, the Former Republic of Yugoslavia, Serbia and Montenegro and Bosnia and Herzegovina. Its use outside of gasoline is still prevalent in many transition countries.

double those of other regions. At the same time, Turkey and other CIS countries also have notably higher rates than the New Accession group and South Eastern Europe, which are actually a little lower than the high-income country group.

Moreover, there are a number of local environmental issues that have had health impacts, do not always appear in the national statistics, but are matters of serious concern in the region. The most serious and still substantially undocumented[9] is the inadequate storage of hazardous wastes that were accumulated prior to transition, including radioactive, military and industrial wastes, especially in the former Soviet Union. The break-up of the Union and the formation of new independent states and the changes of ownership meant that many of these wastes have no legal owner[10]. To make matters worse, most countries, apart from the New Accession group[11], often have little capacity to improve the situation. The following are examples of the problems that have been identified at the local level but as yet not adequately addressed. They include hazardous wastes and land contamination, water quality and quantity, solid waste management, and air pollution.

Hazardous wastes and land contamination

In 2001 UNEP identified 10 hot spots as potential hazards in Albania, of which five were considered critical. These were: (a) the chemical plant at Durres, where there is heavy soil and water contamination from chlorobenzene and other toxic chemicals, (b) the chlorine alkali and PVC factory at Vlorë, with mercury and chlorinated contamination of soil, (c) the Marize oil field in Patos, with severe soil and groundwater contamination from crude oil, (d) the oil refinery at Ballsh, with similar problems, and (e) the waste disposal site at Sharra where toxic waste has been leaching into ground water and there is an air quality problem from uncontrolled incineration. A particular problem is the use of these former industrial sites for residential purposes: illegal construction of houses in abandoned industrial sites has been reported and nearly one-third of the Albanian population lives in these illegal settlements. This increases the exposure of the population to hazardous substances, and results in increasing risk to human health, especially for children, who may ingest particles of contaminated soil, due to the 'hand to mouth' activity. Although donors have assisted in defining action plans, the actual remediation measures are still not in place.

[9] Some progress has been made recently in this regard in South Eastern Europe.

[10] In Eastern and Central Europe, as elsewhere, risk from hazardous wastes can be characterized as falling into four primary areas: 1) direct physical injury from explosions and injury in handling wastes; 2) pathogenic infection from sewage sludge and hospital wastes. Hospital wastes are a very major concern in most of these countries, few of which use incineration extensively. In some countries the problems are compounded by inadequate sanitary programs related to both municipal garbage and hazardous wastes, which promote spread of infection via flies, cockroaches, and rats; 3) direct chemical poisoning leading to organ dysfunction; 4) reproductive, neurobehavioral, and genetic disorders resulting from chronic exposure to hazardous chemicals from waste sites. Unfortunately, there have been few attempts to evaluate by epidemiological techniques the impact of hazardous wastes on the local population in this part of the world. (Carpenter *et al.*, 1996)

[11] The situation is improving in some but not all of the New Accession countries. Poland, for example, had serious contamination problems in the earlier years of transition, when only 15-20 percent of hazardous waste was treated. There was also an issue with importing of hazardous materials for disposal. Much of that has now been reversed and the generation of municipal waste is among the lowest in Europe.

In Armenia, many of the problems arise from the mining sector, where management of tailings and other emissions is not adequate. A typical case is the Teghut open pit copper mine, where civil groups have expressed concern about its environmental impacts, especially on health. The National Environmental Action Plan of 2007 has noted the problems of inadequate monitoring of hazardous waste and persistent organic pollutants (POPs) in the environment and the lack of an inventory of hazardous waste accumulated in the country. With mining activities having expanded considerably in recent years, the problem is growing and needs to be tackled with some urgency. There is generally a need to create specialized landfills for hazardous wastes and remediate polluted areas and dumps, the full extent of which are yet not known.

Major land contamination in Azerbaijan was found to be as a result of oil extraction and refining complexes in Baku and Sumgait, the site of a century of oil production and environmental neglect. Large quantities of toxic waste run-off and spills have been generated by onshore and offshore oil fields, refineries and petrochemical plants, resulting in the shorelines and near-shore water being heavily polluted in many areas, most prominently in Baku Bay. An estimate of 30,000 hectares has been contaminated by a numbers of substances, including oil products. (EEA, 2003)

Pollution related to oil industry is also a matter of concern in Kazakhstan. The new Kashagan oil field at the mouth of the Ural River has raised concerns with several potential environmental problems: 1) damage to the shallow sea and to the beluga sturgeon fisheries for which the Ural delta is one of the last breeding grounds, 2) risks of earthquakes if the oil, which is found at very high pressures, is removed, and 3) the stockpiles of sulfur, which are growing from the oil and gas that is currently extracted and will grow even further when this field starts functioning. In this country, the potential problem of radioactive solid and liquid waste deposits near the Gurevskaya nuclear power plant has also been noted. These wastes have been dumped in a number of depressions over karstic formations, and they may be leaking radioactivity via the subsurface. Hard data on this problem are lacking.

Stockpiles of obsolete pesticides are one of the chief POPs-related problems in Bulgaria – a legacy from the chemicals-intensive agricultural practices before transition. There are numerous uncontrolled stockpiles of obsolete pesticides scattered all over the country, located mainly around severely damaged and pillaged old buildings that used to be part of the infrastructure of the socialist agricultural cooperative system. The measurements of soil contamination by the European Environmental Agency (EEA) have shown the presence of DDT metabolites (with the highest concentrations in the Sofia region), and this indicates recent usage of the banned pesticides. This points to the fact that farmers are generally uninformed or careless about the hazards related to the use of obsolete pesticides. The Ministry of Environment and Water has been working extensively for the collection, repackaging and safe storage of old pesticides, but this is not yet completed. Disposal of hazardous wastes generated largely by the industrial sector forms another major concern of this country. Although 94 percent of these wastes were deposited in specialized landfills or storages onsite, none of the 18 sites in the country complied with the EU requirements, as of 2005. Also, current national legislation requires special treatment for hazardous waste from households, but no effective measures for its implementation are in place yet.

In Kyrgyzstan, the indiscriminate use of chlor-organic pesticides (COPs) has been identified as a serious health hazard in some regions, such as Karasuu, Aravan, Nookat, Uzgen, Karakulzha and Alay. It was noted that breast cancer rates in the region have risen 15 times from 1992 to 2006 and were estimated at 7,460 per 100,000 women during the period of 2004-2006, two orders of magnitude higher than the age standardized rates for this type of cancer in Europe. Similarly, in the Osh region, where pollution of groundwater as a result of the use of pesticides has become a growing problem, cancer rates for women have increased from 1999 to 2006 by between 11 percent (ovary and body uteri) and 53 percent (cervix uteri) (Toichuev and Paizova, 2007). Moreover, several inadequately protected uranium mining tailing dumps in Kyrgyzstan, as well as in Uzbekistan and Tajikistan, are of particular concern, since they are located directly on the flood plains of rivers, and there have already been episodes of flooding that have washed away the protective dams at uranium and lead treatment plants.

With heavy legacy of contaminated land from the Soviet period, many places in Russia suffer from associated health and ecological damages. Although a full inventory of affected sites is not available, the area of land classified as contaminated has been increasing by about 7,000 hectares per annum, amounting to 1.2 million hectares in year 2000. The main cause is mining activities, generating tailings, ash and slag. There is also a concern with contaminated land in cities, where around 10 percent of settled land is classified as 'dangerous'. In 2001, 14 percent of soil samples from built up areas did not meet the required standards for human occupation. Moreover, remaining stocks of pesticides can be a large threat in spite of significant reduction in the use of pesticides in the past few years. Official estimates suggest that the total amount of dangerous or unrecognised pesticides stored in the 11 regions of Russia exceeds 4,500 tons and can reach up to 14,000 tons. A special issue that is of growing concern in this country is that of oil pollution. Official figures suggest that annually out of 300 million tons of the oils extracted in the country, 1.5 percent and more is lost at extraction, exportation, or storage. Also, about 800,000 hectares of the land needs to be cleaned from oil (Chernih and Solodoukhina, 2008). The Khanty-Mansiyskiy area in West Siberia, for example, is one of the most important territories for Russian oil and gas production, and large areas here are oil and waste water polluted from pipeline leakages with heavy direct impact on underground and surface water quality, ecological conditions and quality of living (Hese and Schmullius, 2008). Hence, special attention is urgently needed to be paid to the impacts of oil pollution on human health, while oil has not been included in the number of detected major pollutants in the present epidemiological monitoring.

Belarus has the legacy of Chernobyl. Yet only a small amount of the substantial funds devoted to this problem are allocated to environmental remediation or to agricultural countermeasures designed to produce 'clean' foodstuffs. An increased effort in this direction is warranted given the fact that a substantial portion of the population remains in the affected areas and depends on agricultural activities for its livelihood. Moreover, while better monitoring of radionuclide is of critical importance, gaps and deficiencies still exist. For example, the timely monitoring of SR-90, a radioactivity hazard, is not taking place owing to a lack of local laboratories with trained staff and required equipment.

In Turkey, contaminated sites constitute a significant problem for public health and the environment. While a complete inventory does not exist, the number is estimated at 1,000-1,500, 5-10 percent of which is believed to be in need of urgent remediation. Four types of contaminated sites are identified: 1) industrial facilities – spills, leaks and chemical storage, 2) municipal and industrial waste disposal sites, 3) mine tailing disposal sites, and 4) illegal waste dump sites. Municipal and industrial waste dumpsites and illegal waste dumpsites make up about 80 percent of the contaminated sites (Ünlü, 2006). Along with enforcement of measures to prevent the generation of new contaminated sites, there is a strong need to establish an inventory and to implement risk-based remediation strategies for the existing sites. (World Bank, 2008)

Water Quality and Quantity

Persistent organic pollutants (POPs) have resulted in water contamination in the biggest lake – Lake Sevan - in Armenia. Residual amounts of DDT continue to be detected in environmental media, soil and surface water for example, as well as in foodstuffs and in human organisms. The monitoring data indicates the presence of Lindane and DDE in 87 percent to 97 percent samples of human breast milk from feeding mothers in rural regions of Armenia.

The problems of the Aral Sea lay back in the 1920s when a decision was made to intensify cotton production in the Aral Sea Basin - Southern Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. By the 1960s, as a result of increasing use of water for irrigation, levels in Sea itself were falling dramatically, and by 2002 the volume of the Sea had declined by 80 percent and salinity had risen from 10 g/l up to 60 g/l. This caused a collapse of the fishery industry and problems for farmers, and affected severely the health of the local population. As EEA (2007) states:

> "Over 1.5 million people in Karakapalstan are considered the most affected. Almost all women of childbearing age suffer from anaemia, which is of highest concern in pregnant women. Most babies are born anaemic. There are increasing rates of miscarriages and pregnancy complications. Thyroid problems are common, probably due to iodine deficit. Repeated outbreaks of infectious diseases are reported and the average life expectancy has shortened, from 64 to 51 years in the Kzyl-Orda region of Kazakhstan. Studies on exposure and impacts of environmental pollutants are scarce, but of most concern are toxic organic compounds. One of the most toxic dioxin congeners dominated in milk of women from Karakalpakstan and Kazakhstan, and the levels were among the highest ever documented. A study involving children from Kazakhstan and Germany indicated high body-burdens of the product of the pesticide DDT in children living in Aralsk, formerly on the Aral Sea shore, and in central Kazakhstan. Average levels in urine were three times higher than the 'normal' values found in children in Germany."

Around 28 million people in the five Central Asian countries of the Aral Sea basin depend on irrigation agriculture for their livelihoods. Since the collapse of the Soviet Union, the irrigation and drainage infrastructure of Central Asia has seen little investment in rehabilitation or maintenance and fast approaching collapse. This is because governments have not invested, farmers do not have sufficient income to

maintain, much less repair and upgrade systems, and institutional structures that have developed since the collapse of state and collective farms are generally not strong enough to either raise funds or to ensure efficient water management. The situation is worsened by the arrangements for the regulation of the Syr Daria River through the Toktugul Reservior. Although this has managed to generate electricity in the winter, it has reduced water availability for irrigation downstream in the summer. These facts were noted in the early years of this decade, but actions to address them have been slow. (Bucknall et al, 2002)

Discharge of untreated wastewater and deterioration in drinking-water pipes are seen as the other primary attributes of water contamination. Water bodies in Kazakhstan are intensively polluted by the country's mining, metallurgical and chemical industries as well as city utilities. The most polluted of all are the Irtysh, Nura, Syr Darya, and Ili rivers, and the Balkhash Lake (EEA, 2007). In Serbia and Montenegro, most of the municipal and industrial wastewater is discharged largely untreated[12] due to little maintenance and no investment for more than 10 years. In Serbia, for example, 29 percent of the water sample taken from piped systems in 2001 did not meet the physical/chemical or bacteriological standards. In Ukraine, the water of River Dniepr was undrinkable in many areas due to a number of pollutants discharged from various sources in the 1990s. This has been a major concern as the river is the country's main water body, making up 80 percent of the country's total resources and providing water for 32 million people. While substantial progress has been made since then, much remains to be done. (UNECE, 2007)

Solid waste management

The amounts of solid waste continue to increase in all the countries in the region, as indeed they do in Western Europe. Whereas in the latter there is a sustained effort to manage collections more efficiently and to increase levels of recycling, there is not a comparable effort in the transition countries, other than the group that is now part of the EU. This, combined with very limited financial resources for most municipalities, has created a crisis of waste management in several countries. New disposal sites are needed but are slow in being developed. Incentives for recycling remain limited and illegal dumping or simple failure of collection is commonplace.

Belarus is a country where negative environmental consequences of inadequate solid waste management are worsening. The proportion of waste stored in poorly controlled sites and the amount of waste generated each year, including hazardous waste, are increasing; also, current facilities of waste disposal are inadequate and under pressure. Clearly, action is needed to address this growing problem.

Solid waste management is a major concern in Croatia. More than half of the municipalities, comprising about 20 percent of the population, do not have organized collection and disposal of solid waste. The situation of collection is slightly improving as collection is growing at 4 percent while generation is growing at 2 percent per year. By contrast, almost no solid waste has been disposed in an environmentally friendly manner, as virtually all disposal sites need rehabilitation. Even though Croatian regulations define all steps in the waste management chain, implementation of those

[12] It is estimated that only 13 percent of treatment plants work satisfactorily and that only about 12 percent of municipal wastewater is treated.

steps is one of the country's greatest issues. Improper practice is evident from the point of waste production to final disposal. For instance, hospitals, the biggest producers of hazardous medical waste, do not implement existing legislation, due to the lack of education and funds. Moreover, information on quantities, types and flows of medical waste are inadequate, as is sanitary control. These can have serious health implications. Currently about 200 landfills and 3,000 illegal waste deposits have been targeted for remediation. Progress is being made albeit slowly.

In Serbia only about 50 percent of solid waste is collected. In particular, waste is not collected in rural regions, and is either burned or disposed of in legal and illegal waste disposal sites by the residents themselves. Besides, none of the approximately 170 official landfills that serve municipalities in Serbia meets sanitary landfill standards. Hazardous waste management is an especially significant problem for the country. About 260,000 tons of hazardous waste, including bio-hazardous waste, is generated per year. There are no permanent storage or disposal facilities available for such waste, leading to onsite storage of the waste or disposal in municipal landfills. Some hazardous waste has been exported to other countries for incineration; however, lack of proper regulation for hazardous waste transportation frequently leads to accidents threatening public health. In Ukraine, about 60 percent of toxic waste – disposed heavy metals, oil products, pesticides, and other materials - is still disposed of in landfills without treatment, and this inevitably increases the risks of ecological accidents.

In Turkey, collection and disposal of hazardous waste is a major problem. According to the Turkish Statistical Institute (TÜİK) survey in 2004, approximately 1.3 million tons of hazardous waste was generated annually, of which 63 percent was stored onsite or disposed of inadequately. Moreover, of the total collected municipal waste, about 65 percent is disposed of in uncontrolled municipal and metropolitan dumpsites. Better regulatory enforcement and phased installation of new treatment facilities are required. There appears to be some improvement in enforcement in the past years or so, but limited treatment and disposal capacity is still a constraint.

Air pollution

Russia has a serious problem with air pollution. An assessment of the impact of outdoor air pollution on public health, based on the 1993 and 1998 monitoring data, showed that 15–17 percent of total annual mortality, accounting for up to 219,000–233,000 premature deaths, might be caused by fine particles (Reshetin and Kazazyan, 2004). In some respects the situation has worsened since then as a result of increases in vehicles numbers and emissions from stationary sources. In 2002, the average annual concentrations of harmful pollutants exceeded maximum permissible levels in 201 Russian cities, home to 61.7 percent of the urban population. An estimate of 22,000–28,000 additional deaths in people over the age 30 in Russia was attributable to road transport-related emissions (ECMT, 2004). Similarly, data on concentrations of total suspended particulates (TSPs) in background urban locations from 98 cities with a combined population of 45 million indicated that the levels of particulate matter are several times above current WHO Air Quality Guidelines. (OECD, 2007a)

In Serbia and Montenegro, air pollution is of particular concern in urban areas. The vehicle pool consists to a large extent of old cars that run on high sulphur diesel and leaded gasoline, and this has been jeopardising public health. Moreover, air pollution and ash problems in the Kolubara-Obrenovac Corridor, at the Pljevlja coal plant, as

well as particulate problems and SO_2 emissions from the Kostalac power plant are all having a high impact on health and the environment. An example of a site where health impacts have been studies is the thermal power plant Nikola Tesla, which operates in Obrenovac, 26 km from Belgrade. It was noted that the wind carried ash particles from the ash deposition landfill towards Grabovac, which is located next to the ash landfill. A questionnaire between 2002 and 2004 was trying to identify potential respiratory health problems in Grabovac. It was found out, compared with those of a clean site, the inhabitants of Grabovac were 1.7 times more likely to visit the doctor because of difficulties in breathing, and the relative risk of chronic cough or asthma was about 1.5 higher. In children, differences in respiratory symptoms were even more pronounced. A child in Grabovac was almost three times more likely to visit the doctor because of wheezing, 1.5 times more likely to have breathing problems for three consecutive months a year, and 2.3 times more likely to suffer from asthma. Asthmatic children in Grabovac were 6.6 times more likely to be on constant medication. Investment has been made to change the technology of ash landfill of this power plant. But since this is only one plant among many with this problem, the issue remains an urgent one to be tackled in the country. (EEA, 2007)

The problem of ambient air pollution is noted in almost all big cities in Ukraine. In addition to the standard air pollutants, a special problem has been identified with polycyclic aromatic hydrocarbons (PAHs). These are products of incomplete combustion of organic matter, e.g. fossil fuels, released to the atmosphere from industrial sources, such as steel or aluminium plants, coking plants and power plants, from domestic sources, such as individual coal-based heating systems and residential wood burning, and from traffic. The impact of the most concern is cancer: epidemiological studies have suggested an association between exposure to PAHs and lung cancer. In children living near (< 5 km) a steel mill and coke oven in the industrial city of Mariupol, mean urinary levels of the PAHs biomarker, 1-hydroxypyrene (1-HP), were the highest yet reported in young children. (EEA, 2007)

III 'GREEN' ENVIRONMENTAL FACTORS

The discussion in the previous section has addressed the 'brown' environmental issues, i.e. those relating to air and water pollution, solid waste and soil contamination. In this section we look at the 'green' issues, including those related to forestry, biodiversity, agriculture and marine resources.

Forest Cover

As shown in Table 5, since the start of the transition period most countries have maintained or even increased their forest cover, except Armenia, Bosnia and Herzegovina, and Kazakhstan. Albania experienced considerable loss in the first decade to 2000, but has recovered that loss since and forest cover in 2005 was slightly higher than in 1990. A recent survey by the World Bank also showed that forest health, i.e. the ability to handle fire, pests and diseases, has improved or remained constant in all countries except Tajikistan and Turkey (Sutton et al., 2007). In general the data on forestry presents a positive picture for the region, but this is misleading in several respects. First, deteriorating forest management has led to over-harvesting in some areas and to an overall decline in forest quality, including declining yields and deteriorating species mix. Second, the crown condition of forests has declined since 1990. In 2001 more than 20% of the sample trees were rated as damaged. Finally,

depositions of nitrogen, acidity and heavy metals exceed critical loads over a large proportion of the monitored plots. (UNECE, 2002)

These features apply to Eastern Europe as well as to Western Europe. Defoliation estimates in classes 2-4 – trees that are moderately or severely damaged or dead – show that the situation has deteriorated with respect to the 1990s, when monitoring started in the following transition countries of Albania, Bulgaria, Croatia, Czech Republic, Romania, Slovenia, Ukraine and Serbia and Montenegro [13]. What is particular to some transition countries is the problem of illegal logging, notably in Albania, Armenia, Georgia, Romania and Serbia and Montenegro. Illegal loggings account for around 10 percent of all loggings in Albania, Georgia, Kyrgyzstan and Russia, but for much higher percentages in Armenia, Azerbaijan, Latvia, Macedonia, Slovakia and Tajikistan. In parts of the Far East of Russia illegal cutting accounts for around half of all logging [14]. The problem of illegal loggings constitutes of two important dimensions. One refers to its environmental and economic impacts. Such loggings are generally high-impact unsustainable, with much greater damage to the surrounding forests than controlled logging. This is resulting in loss of high value species and complete denudation of some areas, and is also causing soil erosion and affecting water resources. Furthermore, logging illegally is symptomatic of a poverty-environment link. Those who cut illegally are often the poor and cannot afford commercial fuels or do not have access to them. In consequence, they suffer from the health impacts of combusting wood and have their poverty status reinforced.

Table 5: Changes in forest cover

	Period (% of land areas)			Trend Change (%)	
	1990	**2000**	**2005**	**1990-2000**	**2000-2005**
Albania	28.80	28.07	28.98	-2.53	3.25
Armenia	12.27	10.82	10.04	-11.85%	-7.21
Azerbaijan	11.33	11.33	11.33	0.00	0.00
Belarus	35.55	37.83	38.05	6.40	0.59
Bosnia and Herzegovina	43.56	43.07	43.07	-1.13	0.00
Bulgaria	30.07	30.51	32.77	1.44	7.41
Croatia	37.84	38.07	38.18	0.61	0.28
Czech Republic	34.03	34.12	34.27	0.27	0.42
Estonia	51.03	52.91	53.88	3.70	1.83
Georgia	39.72	39.72	39.72	0.00	0.00
Hungary	19.55	20.70	21.45	5.89	3.62
Kazakhstan	1.27	1.25	1.24	-1.67	-0.83
Kyrgyzstan	4.36	4.47	4.53	2.63	1.28
Latvia	44.72	46.49	47.40	3.96	1.94
Lithuania	31.03	32.23	33.47	3.86	3.86
Macedonia, fmr Yug Rp	35.80	35.80	35.80	0.00	0.00
Moldova	9.70	9.91	10.01	2.19	0.92
Poland	29.17	29.76	30.01	2.02	0.83
Romania	27.78	27.71	27.71	-0.24	-0.01
Russian Federation	47.90	47.92	47.89	0.04	-0.06
Serbia and Montenegro	25.09	25.97	26.41	3.52	1.70
Slovakia	39.96	39.95	40.12	-0.01%	0.42%
Slovenia	58.99	61.52	62.76	4.29	2.02

[13] Very little data are available for Russian and none for Central Asia and the Caucuses.
[14] Data collected from UNECE/FAO and WWF.

Tajikistan	2.92	2.93	2.93	0.49	0.00
Turkmenistan	8.78	8.78	8.78	0.00	0.00
Ukraine	16.01	16.41	16.53	2.54	0.68
Uzbekistan	7.35	7.75	7.95	5.48	2.58

Source: FAO statistics

Biodiversity

A measure of biodiversity, albeit inadequate, is the land area that is protected[15]. As shown in Table 6, transition countries have seen an increase in protected areas from 1990 to 2005, except Armenia, Bosnia and Herzegovina, the Czech Republic and Estonia. Romania witnessed some decline in the period of 2000-2005, but the total protected area was still greater in 2005 than it was in 1990. Biodiversity hot spots in Europe are to be found in the Mediterranean, the Caucasus, the mountains of Central Asia and the Irano-Anatolian region – a natural barrier between the Mediterranean basin and the dry plateaus of western Asia (EEA, 2007). Of these four regions, all except the first[16] lie exclusively in the transition countries.

Table 6: Percentage of protected areas

	% of total land areas		
	1990	**2000**	**2005**
Albania	0.77	2.34	3.36
Armenia	2.52	2.27	2.13
Azerbaijan	1.05	1.05	1.05
Belarus	1.73	2.35	2.77
Bosnia and Herzegovina	0.49	0.39	-
Bulgaria	0.42	0.42	-
Croatia	0.07	0.11	0.13
Czech Republic	2.50	2.65	2.41
Estonia	3.61	3.28	3.40
Georgia	2.14	3.27	3.25
Hungary	0.85	1.90	4.43
Kazakhstan	0.03	0.04	0.35
Kyrgyzstan	0.14	0.37	0.49
Latvia	-	4.98	6.45
Lithuania	2.55	2.65	2.98
Macedonia, fmr Yug Rp	-	-	-
Moldova	1.34	1.34	1.34
Poland	0.57	1.27	1.44
Romania	0.86	1.34	1.21
Russian Federation	0.70	0.96	0.98
Serbia and Montenegro	-	-	-
Slovakia	1.66	1.96	2.00
Slovenia	2.73	4.12	4.22
Tajikistan	2.37	2.46	2.46
Turkmenistan	0.22	0.22	0.22
Ukraine	0.47	0.43	0.43
Uzbekistan	0.20	0.51	0.66

Source: FAO statistics

† '-': No data available

[15] These areas include forest and woodlands which have been protected for biodiversity as the primary function. However, those areas protected for water and soil were not taken into account in the figures.
[16] Turkey and some countries in group b, such as Croatia, are included in the Mediterranean.

In the Mediterranean region, the threats are from urbanization and tourism, in particular on the coasts, forest fire, land abandonment, intensification of agriculture and forestry, water abstraction and pollution, and, increasingly, desertification. In the Caucasus, problems are caused by illegal logging, overgrazing, poaching, overfishing, infrastructure development, and pollution of rivers and wetlands. In the mountains of Central Asia, mining, overgrazing, poaching, water abstraction and drainage are identified as the main causes of loss of biodiversity. Finally in the Irano-Anatolian region the main threats are the development of irrigation schemes for agriculture and associated infrastructure such as dams, overgrazing, overharvesting of woody plants for fuel wood, and mining. Such activities would not have harmed biodiversity if they had been taken with care and if adequate mitigation measures had been put in place. Unfortunately too often this is not the case. Indeed, for all the transition countries in groups b, c and d, the key factor is the lack of resources and capacity for enforcement of regulations to protect biodiversity. To a considerable extent, this counteracts the fact that protected areas have been maintained or even increased.

Agriculture

In the early years of the transition, agriculture declined widely in the face of increasing competition from outside and the lack of access to the inputs on which it was dependent. This is now being reversed but a number of problems remain. Soil fertility has declined in much of South East Europe (SEE) [17] as well as in the countries of Eastern Europe the Caucasus and Central Asia [18] (EECCA). In both groups part of the decline is due to reduced application of fertilizers, but there are special factors that apply individually to certain countries. Soil erosion is a problem in some of the arid countries in SEE and in most of EECCA and acidification is a factor in some of SEE, as well as in Poland. Increasing salinity is observed in parts of Turkey [19] as well as in many irrigated regions of EECCA. The share of irrigated agriculture affected by moderate to severe soil salinity ranges from around 20 percent in Azerbaijan and Uzbekistan, 30 percent in Kazakhstan, Russia, and Ukraine, to over 90 percent in Turkmenistan. (Sutton et al., 2007)

These trends have important implications as agricultural output has a greater share of GDP in these countries than it does in countries of group a and Western Europe. In the SEE countries, for example, it makes up 14 percent of GDP and in EECCA it makes up 18 percent, compared to an OECD average of 2.2 percent. The losses resulting from falling yields impact on the incomes of a significant number of rural households. For example, salinity is estimated to cost Uzbekistan US$1 billion a year, i.e. approximately 8 percent of its GDP, and soil erosion is estimated to result in losses of at least US$40 million in Moldova. Moreover, the impacts are cumulative: initially damages from soil erosion may be small but after 10 or 20 years the cumulated impact can be significant. Hence action is needed to arrest these trends,

[17] Largely group b in our classification, made up of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Serbia, Montenegro and Turkey.
[18] Groups c and d in our classification, made up of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
[19] Programmes to address it are being implemented.

and indeed some measures are being introduced, with help from the international community[20].

Marine resources

The European Environment Agency reports that marine resources in Europe as a whole are in a poor state, with overfishing[21] widespread and eutrophication a common occurrence in enclosed seas and sheltered marine waters. The Black and Caspian Seas, where the transition countries are the dominant littoral states, are in a worse state than the western seas, with the Black Sea particularly affected by overfishing, eutrophication and invasive species and the Caspian Sea suffering from overfishing and industrial effluent, including oil spills.

Perhaps the most telling story of environmental marine mismanagement since the start of the transition is that of the Caspian Sea[22]. Prior to 1990 it was managed by the USSR and Iran, and each had good reason to cooperate and did so in the broader interests of sustainable use of the resource. After the break-up of the USSR, however, the situation changed dramatically. The cooperative model proved less compelling, partly because the Parties have no established relationship in this area and partly because they are unable to control their citizens, some of whose livelihoods have come under serious threat after the dissolution, and some of whom are able to act outside the law with impunity, often making considerable profits from doing so.

These issues are brought out most clearly by looking at one of the key resources of the Caspian – the sturgeon. Catches have varied widely over the last century as a result of natural reasons as well as man-made interventions, such as construction of dams, which impeded access to spawning grounds for the fish. Nevertheless the catch had fallen significantly from 13,300 tons in 1990 to 800 tons by 2005. Overfishing, poaching and illegal trade are the main factors responsible for this. There has also been an impact from habitat destruction, water pollution and oil spills. Measures to restore the sturgeon are part of the Caspian Environment Program, which provides support for alternative livelihoods for affected parties, funding for hatcheries to increase the population and restrictions in illegal trade in caviar to reduce the incentives for poaching. In spite of all this, an agreement on allowable catch that is enforced is essential if the fishery is to survive, and the moment that is not guaranteed.

IV POLICY RESPONSES AND RESOURCES FOR THE ENVIRONMENT

Resources in Transition Countries

The transition from a centrally planned economy to a market-based one also required changes in the way the environment was regulated. This process has been ongoing

[20] World Bank studies have found that these projects have high economic and social benefits. In Turkey, for example, a watershed rehabilitation project in Anatolia focusing on reducing erosion and flood control has an economic return of 19 percent, even if other environmental benefits are excluded. An ongoing project aimed at reducing salinity in Uzbekistan and enhancing wetlands has an estimated return of 24 percent with significant environmental side co-benefits.

[21] Since 1990 marine fish catches have declined by about 15 percent in the EU 25 countries but have increased in the SEE countries by 19 percent and in the EECCA countries by a massive 91 percent (EEA, 2007). These figures exclude illegal catches, which are believed to be significant in the EECCA region.

[22] For more details see Markandya and Auty (2006).

since the early 1990s, supported by the international community and especially the European Union. For the ten countries that are now member states, the requirements of the environmental *acquis* have been the driving force[23]. The main reforms required by the EU directives were in the areas of water supply, waste water, solid waste, use of chemicals on land, integrated permitting of industrial processes and protection of natural habitats. Agreements had to be reached in the case of each member state to a time bound programme for compliance with the relevant directives. The associated costs have been coming out more than the original estimates – around €1,260 per capita, with a range of between €580 and €3,600 (EDC, 1997), with additional operating costs estimated to be about €80-120 per capita per annum. Although some estimates suggest that perhaps a quarter of the total cost is covered by various EU funds, it appears that, compared to expenditure prior to becoming a member state, the new member states have had to double their allocations of resources on environmental protection.

With such high costs involved, a question was posed as to whether the benefits justified the expenditures. Ecotech (2001) estimated that while the benefits were usually greater than the costs, it was not so for all directives and for all countries, e.g. for the waste directives the estimated costs were over the benefits. This suggests that some programmes that the new member states have implemented or are implementing entail a 'price' that is not justified on cost benefit grounds. Furthermore, funding some of these programmes remains an issue: public resources are limited and access to private finance is, though being developed, still problematic. Main difficulties are seen with the directives for waste management and water quality for rivers and other water bodies, where it is difficult to recover the costs, either through charging the polluters or making the beneficiaries pay.

In other transition countries, as economic transition leads to a shift in the responsibilities for protecting the environment, an increasing share of total environmental expenditure being undertaken by the private sector would be expected to be seen. Meanwhile, these countries have a legacy of environmental problems, implying the strong need of an increase in resources allocated to the environment from public sources. OECD (2007b) has noted the sharp contrast in environmental expenditure between the bigger and wealthier economies in the region, such as Russia, Kazakhstan and Ukraine, and the poorer ones, such as Moldova, Azerbaijan, Georgia, the Kyrgyzstan, Armenia and Tajikistan. In the former group environmental expenditures have increased to levels that are comparable with the new member states of the EU that in turn are spending as much or even a little more as a share of their GDP on the environment than existing members. However, it is noted that the expenditure is still less than what is required to address the major environmental challenges that they face. In the latter group of smaller countries, environmental expenditure, by contrast, is very low in absolute and in relative terms[24]. Decision-makers of these countries are inclined to wait for reaching higher income levels before allocating more resources for environmental purposes, despite the positive effects that such expenditures could have on economic development and public

[23] These requirements have also been very influential in the aspiring countries for South Eastern Europe, in Turkey, and, to a lesser extent, in the countries belonging to the neighbourhood group - the Western Balkans and the Commonwealth of Independent States.

[24] In this respect Belarus is an outlier, with expenditures similar in percentage terms to Russia and the other large economies.

health. As far as the shift to private spending is concerned, data is insufficient to give a clear picture.

In terms of external assistance, the amount provided to the twelve EECCA countries in groups c and d from multilateral sources has doubled between the period prior to 2001 and the period 2001-2005, with an increasing share of it coming in the form of loans. In the post-2001 period, multilateral assistance amounted to around US$360 million per annum. By contrast, bilateral assistance has declined between the pre and post-2001 periods and was around US$191 per annum in the latter, mostly in the form of grants. However, both bilateral and multilateral assistance particularly favour large, oil-producing countries: the Russian Federation and Kazakhstan together received respectively 50% and 75% of bilateral and multilateral assistance since 2001. Turkmenistan and Belarus have hardly received any environmental assistance. Nevertheless, bilateral and multilateral environmental assistance remains marginal[25], and cannot be a substitute for domestic environmental finance in these countries.

Projects supported by the international community are recognised as having particularly positive demonstration and catalytic effects, in terms of technology transfer and the development of new skills and know-how. As the Sixth Ministerial Conference on Environment for Europe in 2007 noted, there needed to be better coherence between national environmental expenditure and international environmental assistance. Moreover, it was recommended that external assistance take different forms in different countries. In low-income transition countries, loans from International Financial Institutions (IFIs) for environmental improvements need to be made more accessible and affordable. In middle-income transition countries, national authorities need to be able to prioritize projects that are appropriate for IFI investment.

Developments in Environmental Regulation and Management

Of the numerous changes in developments in environmental regulation and management that have taken place in the transition period, three deserve special mention. The first is the increasing role of public participation, the second is the increasing use of market based instruments and the third is the growth of international cooperation to deal with transboundary problems.

A key part of any modern system of environmental regulation is the access to information about environmental trends and impacts on the ambient environment for the public. Given the weaknesses observed in compliance and the limited resources of the state in ensuring compliance, the role of civil society in holding polluters to account is even more critical in the transition countries. In this respect the Aarhus Convention[26] has played an important role in the transition process. Adopted in June 1998 and entering into force in October 2001, the Convention is built around three pillars: access to information, public participation, and access to justice. Most transition countries have signed the convention, except Russia, Uzbekistan and Turkey.

[25] Bilateral environmental assistance represents less than US$1 per capita per year, and multilateral environmental assistance is about US$1.3.

[26] Formally known as the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters

UNECE (2005) showed that the EECCA countries have been most active in implementing the pillar of access to information pillar, whereas implementation of the public participation was still at a preliminary stage and that of the access to justice was the weakest. Implementation appeared most advanced in Belarus, Kazakhstan, Moldova and Ukraine, somewhat less so in the three Caucasus countries, and Kyrgyzstan, Tajikistan and Turkmenistan seemed to have made the least progress. A significant problem seen in these countries is the failure to introduce legislation for implementing the Convention, even if under their constitutions the Convention applies directly and/or has precedence over national laws. Other key challenges include funding shortages and poor implementation by public authorities at sub-national level and by non-environmental authorities. In comparison, in the SEE countries, significant progress was mainly achieved in specific legislation related to public participation by the ratifying the Aarhus convention and/or through the adoption of national laws and strategies (EEA, 2007). Environmental information available through the internet has generally or partly increased since 2005 throughout the region. Most countries maintain national web portals or other sites of interest to ensure that environmental information is available electronically. Several countries have an Aarhus Clearinghouse web portal in operation to promote the exchange of information, and to ensure public access to information and participation in decision-making.

As the demand for higher environmental standards has grown and as the costs of achieving these standards through direct controls has increased, governments have increasingly turned to indirect methods of regulation, based on exploiting fiscal incentives for firms and households. The scope of such instruments ranges from charges on emissions to air and water, charges for collection of wastes that reflect the social costs of that collection as well as the final delivery of the waste, charges on certain products that include a component for the final proper disposal of the item, such as tires, batteries, etc., and subsidies for the adoption of cleaner, less polluting technologies. Not only are these instruments a less expensive way of meeting environmental standards, they are also a means of raising revenue that can be used to finance related environmental expenditures in the public and private sectors.

Many of these transition countries had a range of emissions charges prior to 1991, but these charges served little purpose as incentives to reduce emissions. In the post-1990 period, many of them have sought to simplify their systems of emissions charges and to introduce new economic instruments more relevant to the needs of their market based economies. Poland, for example, raised its emissions charges several-fold, with consequent increases in revenues and some declines in emissions, and similar measures were introduced in other new accession states. All transition countries have also raised user charges for services such as water supply and waste collection. As a result, user charges represent the largest source of finance for environment-related expenditures[27]. Tariffs and collection rates have increased, and, in most EECCA countries, are coming close to covering operation and maintenance costs – aided by increases in operational efficiency (OECD, 2007a). The revenues from these charges are earmarked for environmental purposes.

[27] Although hard figures are not available, user charges are likely to contribute over half of financial resources for the provision of water and waste services.

The importance of international cooperation in addressing environmental problems has increased in recent years, outstandingly with the growing recognition of climate change as a global phenomenon, but also with the increased importance attached to long range air pollution, pollution problems and overfishing in the international seas, and concern with the losses of biodiversity. The countries of the transition group are playing their part in addressing many of these problems but there is still some way to go. For example nine of the twelve EECCA countries are parties to the UNECE convention on Long-range Air Pollution and its eight protocols. But not all related protocols and conventions are signed by all countries. Important protocols with missing signatures include those relating to sulfur and nitrogen oxides to persistent organic pollutants (POPs) and to heavy metals. In addition, only six of the twelve EECCA countries have ratified the Convention on Transboundary waters. In the Caspian Sea region, the four EECCA countries (along with Iran) have ratified the Framework Convention for the Protection of the Marine Environment of the Caspian Sea. With international support, they have also developed guidelines that provide step-by-step procedures for implementing the UNECE Convention on Environmental Impact Assessment in a Transboundary Context. By contrast, while oil pollution is one of the most significant pressures in the Caspian Sea area, low existing penalties for oil pollution and little government control have resulted in little incentive for oil companies to minimise discharges to the environment.

One of the problems with the SEE and EECCA countries is that while they may sign international agreements they do not always meet their obligations under the agreements. The main barriers seem to be inadequate technical, administrative and financial capacity, weak information management, a lack of co-ordination among relevant national authorities and insufficient and unstable domestic funding.

V CONCLUSION

The last 20 years has seen the transition group of countries respond in markedly different ways to the challenges of the socio-economic changes they faced. As far as the environment-associated health indicators are concerned, the New Accession states are catching up with the older members of the EU and the high-income countries in general. Even though, the problems of outdoor air pollution are still severe in these countries. Moreover, the progress in dealing with hazardous waste and the legacy of contamination appear heterogeneous across these countries. For the Balkan states of South Eastern Europe, the quality of water has been deteriorating in spite of a high access of water in this region. At the local level, hot spots have been identified in a number of countries and they are largely relate to contaminated land, improper storage of toxic materials, and power or industrial plants that are creating local hazardous conditions. The countries of Central Asia have noted the worst health record. Outdoor air pollution, smoke from solid fuel use in the home, exposure to lead and unsafe water and sanitation are reckoned the most threatening environmental factors to people's health. At the local level, there are many issues that need to be addressed. One of the most serious is that around the Aral Sea, where there is economic and social collapse. There is also an ongoing critical situation with respect to hazardous waste and soil contamination. The last group, dominated by the Russian Federation, has seen considerable economic progress, but one the environmental side things do not look so good. The problems of outdoor air pollution and indoor air pollution remain the matters of serious concern. Drinking water quality is

deteriorating in some places, and the legacy of past radioactive and other toxic contamination has yet to be fully addressed.

What has been happening to the 'green' environment in the transition countries shares a lot with the trends in the rest of Europe: 1) important losses of biodiversity, 2) the declining marine environment, and 3) the worsening quality of forest cover. At the same time there are areas of greater concern in the transition group, especially within the countries of groups b, c and d. The main negative trends in the transition period include: 1) increases in levels of illegal logging, 2) inadequate management of areas of high biodiversity and a lack of proper monitoring of changes in the biodiversity, and 3) deterioration of the marine environment in the Black and Caspian Seas. In addition, and perhaps most important of all, we have seen declines in agricultural productivity that need to be tackled with some urgency. The immediate causes are: acidification, soil erosion and salinity in deteriorating irrigation systems. Fortunately, these can be addressed, and resources allocated to doing so have very attractive returns.

When it comes to the way the transition countries finance their environmental expenditures and the policies they adopt to regulate the environment, they can be grouped into three: 1) those that are now more or less at a par with the developed OECD group, including most of the new member states, with Bulgaria and Romania being a little behind the rest; 2) those that are making progress at a slower rate but where the gap is not that great, including three of the four former members of the Soviet Union located in the European part of the USSR (Belarus, Russian Federation and Ukraine) as well as Kazakhstan from Central Asia and Croatia in the Balkan region; 3) those where there really is a major gap and a long way to go, including the remaining former members of the Soviet Union located in Central Asia - Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, and the rest of the Balkan countries excepting Croatia are in this group.

At the same time some progress is taking place and some important issues are being addressed in all the countries, with support from the international community. The role of this international support is recognized as of considerable value, although there are issues of donor coordination and coherence between national environmental expenditure and international environmental assistance; and problems of affordability of international credits, especially in the low income countries of the group. Positive developments in the use of market based instruments and in using revenues from environmental charges to finance environmental investments are also taking place across the region. While the transition countries are contributing as part of the international community to addressing global and regional environmental problems, they still have some way to go in terms of signing up to the relevant agreements and, more importantly, in fulfilling their obligations under these agreements.

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